Traceable Calibrations Gases: SRMs, NTRMs, and Protocol Gases

There are two NIST gas standard programs that provide calibration gas standards with NIST analyses and concentration value assignment. These are the gas mixture Standard Reference Material (SRM) program and the NIST Traceable Reference Material (NTRM) program. These two programs still could not provide all of the needed standards required by the US Environmental Protection Agency (EPA) so the Protocol Gas program was initiated to provide an additional mode of NIST traceability.

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The Gas Mixture SRM and NTRM Programs provide a mechanism to produce needed calibration gas standards with defined NIST traceability. These calibration gas standards are mixtures contained in high-pressure compressed-gas metal cylinders. In the SRM program, NIST initiates the production of mixtures after which NIST analyzes every SRM mixture and assigns certified concentration values. In the NTRM program, specialty gas companies initiate mixture production with NIST concurrence, after which they analyze 100% of the cylinders and NIST selects 10% for NIST analysis. NIST assigns certified concentration values by combining the NIST data with the producer's data. Both programs require that mixtures be made as a group of cylinders with identical content. These mixtures are specified in the Code of Federal Regulations (CFR) to calibrate instruments to be used to monitor regulated emissions. The NTRM program was developed to augment the SRM program because the SRM program could not provide all of the needed standards. The NTRM program was expanded to include the NTRM Prime (NTRM'), where NIST analyzes every sample, to address the needs of certain customers.

NIST TRACEABLE GAS STANDARDS:

SRM: **NIST initiates production of the gas mixtures, analyzes each cylinder, and assigns certified concentration values.**

NTRM: **Specialty gas companies initiate mixture production and analyze 100% of the cylinders and NIST selects 10% for NIST analysis.**

NTRM': **Expanded from the NTRM program, where NIST analyzes every sample to meet customer needs.**

Protocol Gas: **Specialty gas companies follow an EPA protocol that specifies blending and analysis of protocol mixtures using SRMs or NTRMs for their analyses. NIST is currently working on a QA procedure with EPA.**

The Protocol Gas program was initiated to meet an even greater demand for standards required by the US Environmental Protection Agency (EPA). In this program, the Specialty gas companies follow an EPA document to blend and analyze individual mixtures using SRMs or NTRMs for their analyses. Protocol mixtures are then sent to end users with no direct involvement from either EPA or NIST. To provide quality assurance (QA) for the Protocol Gases, NIST is now working with EPA on a verification program where Protocol Gases can be sampled and analyzed at NIST to determine compliance with producer certificates.

NIST-traceable calibration gas standards are stipulated in the CFR to be used for the calibration of instruments employed in the monitoring of regulated emissions.

The gas mixture SRM program satisfied the original traceability needs of end users faced with meeting the CFR compliance regulations. As the demand for more traceable mixtures increased, new programs were developed to fill the need. The SRM and NTRM programs involved direct NIST traceability whereas the Protocol Gas program does not have that. NIST is meeting the needs for improving the traceability chain by doing QA analyses on selected Protocol Gas standards. At every stage of increased calibration gas standards needs, NIST has been flexible and responsive enough to work with EPA and the Specialty Gas Industry to develop programs to meet their needs.

Impact: A large number of gas measurements mandated by CFR require calibration standards traceable to NIST with low total uncertainty. Standards supplied by the SRM program are the most suitable but are not always available and are resource-intensive for NIST to provide. The normal NTRM program provides standards that by their have greater uncertainties than the SRMs. The NTRM' program provides a mechanism to provide required calibration gas standards in a timely fashion with NIST traceability and a low total uncertainty. NIST involvement in the Protocol Gas verification program provides assurance that these mixtures comply with certified information.

Future Plans: To support the needs of the SRM, NTRM, and NTRM' programs, NIST plans to increase the number and concentration ranges of gas species for which it maintains primary standards that are the foundation of these programs**.** NIST will continue with the Protocol Gas verification program. A meeting is to be held at Pittcon 2006 in Orlando to which all interested parties are invited – NTRM Producers, regulating bodies, and end users – to discuss the NIST programs and to evaluate the results of recent verification analyses.